

# Research and Practice of the Training Mode of High-Quality Fishery Technical Skills Talents Based on the Integration of Industry and Education—Take the Major of Aquaculture Technology in Jiangsu Vocational College of Agriculture and Forestry as an Example

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**Abstract:** *In response to national policies, this paper actively explores new models for cultivating talents in fisheries-related majors at higher vocational and technical colleges. Taking the Aquaculture Technology major at Jiangsu Agri-Forestry Vocational College as an example, and guided by the integration of industry and education, the paper strengthens the depth and breadth of school-enterprise cooperation, leverages the advantages of both parties, and explores and practices in talent training models, talent training programs, curriculum systems, course resources, classroom teaching, on-the-job internships, practical platforms, dual-teacher teams, and evaluation systems. The goal is to achieve alignment between the major and the industry, alignment between course content and occupational standards, and alignment between teaching processes and work processes, to meet the current demand for high-quality technical and skilled talents in the fisheries industry.*

**Keywords:** *Industry-Education Integration; Fisheries Technology and Skills Talents; Talent Training Model; Research and Practice*

## 1. Introduction

Higher vocational education plays a crucial role in the national economic development and education structure. As China enters a new development period with industrial structure adjustments and technological upgrades, there is an urgent demand in various industries for high-quality technical and skilled talents, especially a significant gap in high-end skilled talents. This has led to contradictions such as enterprises facing "difficulty in recruiting" and students facing "employment difficulties" [1]. Industry-education integration is the organic combination of "industry" and "education," integrating the industry's demand for talents with the school's talent cultivation, building a mutually dependent and mutually reinforcing cooperative relationship, and realizing targeted talent cultivation. When schools and enterprises achieve in-depth cooperation, schools provide talents and research support to enterprises, while enterprises provide economic and resource support to schools, achieving a win-win situation [2]. The newly revised "Vocational Education Law of the People's Republic of China" proposes, "Vocational education must adhere to industry-education integration and school-enterprise cooperation, insist on facing the market and promoting employment." Therefore, higher vocational education must deeply integrate with the local regional economy to promote technological transformation and upgrading of enterprises, fulfill its historical mission, and, in the dual-track talent training process of school-enterprise cooperation, both parties benefit mutually, improving the quality of talent cultivation [3]. Industry-education integration and school-enterprise cooperation are the basic operation modes of vocational education, the key to running vocational education well, and the lifeline for promoting the high-quality development of modern vocational education. In recent years, China's aquaculture industry has achieved significant results, making outstanding contributions to promoting the prosperity of the fishery industry and the prosperity of fishermen's lives. However, the problem of the large scale but weak competitiveness of China's aquaculture industry is still prominent. Achieving high-quality development of China's fisheries, transforming from a large-scale aquaculture country to a strong one, is a strategic goal for the future development of aquaculture, and the successful achievement of this goal depends on the effective cultivation of talents. Taking the Aquaculture Technology major at

Jiangsu Agri-Forestry Vocational College as an example, this paper, under the background of industry-education integration, relies on the China Modern Fishery Vocational Education Group, a shared platform. The paper conducts in-depth school-enterprise cooperation in talent training models, talent training programs, curriculum systems, course resources, classroom teaching, on-the-job internships, practical platforms, dual-teacher teams, and evaluation systems. The goal is to cultivate high-quality technical and skilled talents adaptable to the development of modern fisheries science and technology, and to contribute to rural revitalization.<sup>[4]</sup>

## 2. Exploration and Practice of Industry-Education Integration in Cultivating High-Quality Fisheries Skills Talents

### 2.1 Collaborative Construction of School-Enterprise Joint Professional Talent Training Model

The school collaborates with leading enterprises in the industry within the China Modern Fishery Vocational Education Group, such as Hai Da Group, Tongwei Group, and Jiangsu Zhongyang Group, to jointly promote talent cultivation. Together, they have researched and determined a professional talent training model characterized by "integrating ethics and skills, two-way fusion, and three-stage progression."

"Integrating ethics and skills" refers to cultivating students to master basic employment skills while also focusing on moral education. It emphasizes political and ideological education, aiming to foster correct values, excellent moral character, and outstanding stress resistance, enhancing students' comprehensive qualities for sustainable development in future workplaces.

"Two-way fusion" means that both the school and the enterprise engage in reciprocal interactions, blending and promoting each other. This is achieved by incorporating job skills requirements, integrating cutting-edge technologies, and infusing excellent industry culture into the teaching process, ultimately achieving the integration of high-quality educational elements, information, and resources.

"Three-stage progression" refers to a curriculum system with a three-stage progressive relationship in "professional cognition—skill training—innovative practice" in the school-enterprise cooperation project. This system provides students with an educational scenario based on project practical experience and hands-on learning. As shown in Figure 1.

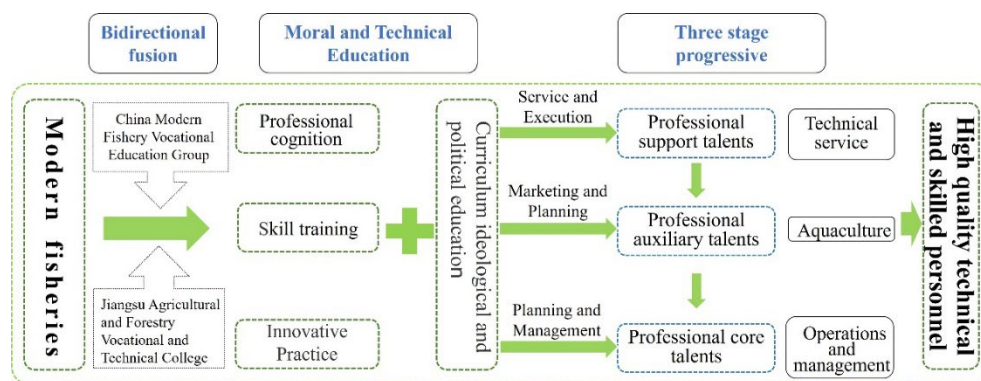


Figure 1: Talent training mode of "German and technical integration, two-way integration, three progressive"

### 2.2 Developing Talent Cultivation Plans Based on Enterprise Needs and Position Requirements

After in-depth analysis of the main knowledge and skills required for typical positions in leading enterprises such as Hai Da, Zhong Yang, and Sheng Tai Er, a joint talent cultivation plan called "Modern New Fishermen" was formulated by the school and enterprises. Focusing on the analysis of grassroots managerial positions in modern fisheries enterprises, the plan targets three major areas: aquaculture, aquatic technical services, and marketing of aquatic products and inputs. Both the school and enterprises organized multidimensional experts to conduct a thorough analysis of the positions. The course content is designed with a focus on the core competencies of frontline managers in fisheries production. It incorporates national vocational skills assessment standards and constructs a modular curriculum system, integrating the three elements of "position, certification, and course." This approach achieves organic alignment with job requirements, certification criteria, and course content.

### ***2.3 Collaborative Development of "Task-Oriented" Course Resources by School and Enterprise***

Leveraging the platform of the China Modern Fishery Vocational Education Group, led by Rizhao Vocational and Technical College, a total of 12 higher vocational colleges, 25 industry enterprises, and 6 research institutes participated in the construction of the teaching resource library for the Fisheries Aquaculture Technology major. Our college took on the task of building two courses, "Production Training" and "Aquatic Operation Skills," within the resource library. Throughout the process of course resource development, a dual-subject approach involving both the school and enterprises was maintained. A teaching team composed of professional teachers and enterprise engineers was established. Over 200 work tasks were distilled from new technologies, processes, norms, and standards in the industry. These work tasks formed the main content for teaching, ensuring that the course content aligns closely with the forefront of the industry and strengthens the integration of teaching content with advanced technologies and production processes of enterprises.

### ***2.4 Cooperative Implementation of "Project-Based" Teaching Reform by School and Enterprise***

In consideration of the characteristics of the Fisheries Aquaculture Technology major and the current status of higher vocational students, a shift from traditional teaching methods was initiated. Utilizing methods such as "project-based teaching," "case-based teaching," and "task-driven teaching," teaching projects were developed based on the principle of "project leadership and task-driven." By identifying specific needs related to positions, the content and process of project-based teaching were determined. Considering students' interests, learning capacities, and innovation capabilities, these projects were designed for teaching, introducing real-life aquaculture scenarios during the teaching process. Virtual simulation, enterprise connectivity, and other teaching methods were incorporated to align teaching content with real work scenarios, enhancing students' application capabilities in professional knowledge.

### ***2.5 Innovating the "Three Pair" Practical Teaching Model***

Practical teaching is a crucial method for enhancing students' practical abilities. The college, considering the seasonal characteristics of fisheries production, has established a practical teaching system of "basic training + teaching production internship + on-site internship" through school-enterprise cooperation. In the process of practical teaching, a "double integration of graduation design and internship tasks, dual guidance of internship process management, and dual evaluation of internship results by both the school and enterprises" three-pair practical teaching model has gradually formed.

The "double integration of graduation design and internship tasks" involves scheduling the completion of the graduation design thesis during the student's on-site internship. The preparation of the graduation design thesis is based on the internship work as the research topic, requiring the comprehensive application of relevant theoretical knowledge and practical achievements in aquaculture. This is achieved under the joint guidance of enterprise mentors and school faculty.

The "dual guidance of internship process management" involves both school faculty and enterprise technical supervisors serving as student mentors. The two parties collaboratively guide students through the entire internship process, with enterprise mentors addressing questions and difficulties arising during the work process, while academic faculty guide students in applying professional knowledge. Our college utilizes the "Gongxueyun" system for student internship management. Students are required to submit daily, weekly, monthly reports, and internship summaries on the platform. Both school and enterprise mentors can track students' internship progress through the platform.

The "dual evaluation of internship results by the school and enterprises" is conducted by an internship assessment group consisting of the school's professional leader, enterprise technical manager, human resources manager, and others. They jointly establish evaluation criteria covering vocational literacy, job skills, and comprehensive innovative capabilities. The assessment primarily focuses on various comprehensive abilities during the school period, mainly evaluated by faculty. During on-campus practical training and enterprise internships, the evaluation emphasizes operational skills and production management capabilities, mainly assessed by enterprise managers. At the end of the internship, enterprise mentors assess each evaluation target and clause based on students' written summaries and daily work performance, while school faculty evaluate students based on their ideological dynamics, proficiency in work skills, and other factors.

Through nearly five years of reform and innovation in the practical teaching model, students majoring in Fisheries Aquaculture at our college have continuously improved their professional skills in specific job positions. This approach achieves synchronization between teaching and fisheries production, connecting professional skills with job requirements effectively.

## 2.6 Collaborative Construction of the "Four-in-One" Practical Teaching Platform by School and Enterprise

Leveraging platforms such as the China Modern Fishery Vocational Education Group Alliance and the Jiangsu Province Yangtze River Characteristic Fish Industry Technology Innovation Strategy Alliance, the college has jointly constructed a practical teaching platform that meets the "four-in-one" cultivation of students in specialized skills, comprehensive job literacy, occupational transfer skills, and professional innovation capabilities. Utilizing jointly established on-campus training facilities such as the fish breeding training room, aquarium landscaping room, and aquaculture demonstration garden, dedicated teachers and senior students serve as team leaders. They mentor junior students in practicing specific professional skills in rotation and participate in various entrepreneurship skills competitions as teams, enhancing students' comprehensive thinking and workplace innovation capabilities. According to the talent cultivation objectives jointly formulated by the school and enterprises, the entire learning process alternates between classroom learning and enterprise on-site internships over a three-year period. The first year and a half involve theoretical learning at the school, followed by the first round of specialized skills training in cooperation with enterprises in the fourth semester. Students return to school in the fifth semester for theoretical supplementation and the enhancement of comprehensive literacy. The sixth semester involves enterprise on-site internships according to innovative practice requirements, and graduates successfully complete seamless integration of internship and practical training assessments conducted by supervisors. As shown in Figure 2.

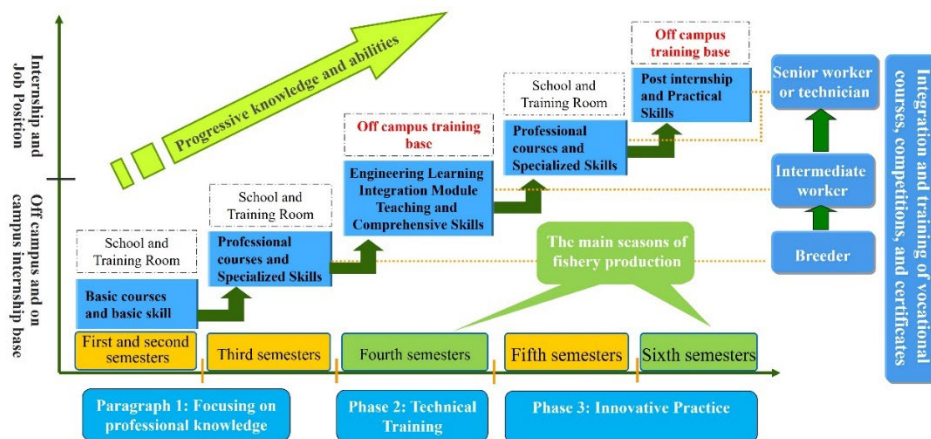


Figure 2: Practical Teaching mode of aquaculture

## 2.7 Establishment of a High-Level Structured Dual-Teacher Teaching Team in Collaboration with Enterprises

The profession has formed a high-level structured dual-teacher teaching team with nine full-time teachers, including one professor and two associate professors. The team of "dual-teacher" outstanding teachers has practical experience in enterprises, including four practicing veterinarians (aquatic animals), one senior aquatic animal disease prevention and control specialist, and two senior aquatic animal breeders. The teaching team is well-structured, primarily composed of teachers with postgraduate qualifications, and exhibits a balanced distribution of age and academic titles. Ninety percent of the teachers have accumulated over two years of enterprise experience, and all teachers hold postgraduate degrees. Additionally, three professionals from institutions such as the Fisheries Technology Guidance Station and Fisheries Research Institute are flexibly appointed as part-time professors. Furthermore, 15 professionals, including technical directors from aquaculture enterprises, are employed as external part-time teachers. The ratio of full-time to part-time teachers is 1:2. In the teaching of the major, there is collaborative division of labor between the school and enterprises, with deep participation in teaching. Simultaneously, a "two-way flow" of teachers between the school and enterprises has been achieved. During the talent cultivation process for the Fisheries Aquaculture Technology major, not only are industry experts invited into the classroom, but experienced teachers

are also arranged to undergo on-site training in enterprises. Experienced teachers provide high-quality theoretical guidance on industry frontiers and training for vocational skills competitions. The team facilitates knowledge transfer among teachers with different professional backgrounds, conducts high-quality vocational training, and leverages complementary strengths between school and enterprise faculty, achieving mutual growth and progress.

### ***2.8 Establishment of a Diversified Evaluation Mechanism and Improvement of a Continuous Quality Assessment System***

Adapting to the specific characteristics of the courses, the major explores the integration of occupational standards such as production management, technical research and development, and quality control into teaching elements such as course objectives, content, and standards. This integration reflects the industry's requirements for the skills, knowledge, and qualities needed for corresponding positions and responsibilities. The major improves a diversified evaluation system in which the school, enterprises, and the community jointly participate. They collaboratively establish evaluation standards and discuss evaluation content, emphasizing quality assessment methods that focus on practical abilities, applied knowledge, and innovative capabilities. The school and enterprises jointly evaluate key aspects such as teaching implementation and goal achievement, sharing evaluation results. Subsequently, the results are used to guide the revision and improvement of teaching outlines, teaching processes, and course assessments. The major constructs a "closed-loop" evaluation mechanism that encompasses monitoring, evaluation, feedback, and continuous improvement. This ensures the ongoing improvement of course teaching, effectively coordinating the continuous enhancement of talent cultivation quality.

## **3. Achievements in Cultivating High-Quality Fisheries Technology and Skills Talents**

In recent years, our college's Fisheries Aquaculture Technology major has achieved remarkable success through collaboration and joint talent cultivation with leading domestic enterprises in the fisheries industry. Students have seen a continuous enhancement of their innovative awareness, a significant improvement in innovation and entrepreneurship capabilities, and a continual elevation of vocational and comprehensive qualities. The quality of talent cultivation has gained high recognition from both enterprises and society.

Students majoring in Fisheries Aquaculture have won numerous awards in national and provincial innovation and entrepreneurship competitions, showcasing their excellence in various aspects. Notably, they have secured a national gold award in the China "Internet+" National College Students' Innovation and Entrepreneurship Competition and a national bronze award in the "Challenge Cup" China College Students' Entrepreneurial Plan Competition. At the provincial level and above, they have accumulated 21 awards, including one national gold award, one national bronze award, and eight provincial first prizes. Additionally, students have received over 10 awards in university-level innovation and entrepreneurship competitions, with four of them earning first prizes. Moreover, three student teams were recognized as outstanding in the "Three Villages" social practice activities.

In terms of social service, many students have actively participated in modern fisheries teaching and technology service teams led by college teachers. These teams work on the frontlines of aquaculture, utilizing their professional advantages to solve practical production issues for fish farmers, contributing to rural revitalization, and earning sincere thanks and unanimous praise from the farming community. The students' practical skills have seen significant improvement, laying a solid foundation for their future employment.

According to a third-party Michael Page survey report, graduates from our Fisheries Aquaculture Technology major have achieved top rankings in terms of income, employment rates, and overall job satisfaction among all majors in the university. The students primarily engage in jobs related to fisheries aquaculture, technical services, and product marketing, with a major-related employment rate exceeding 90%. The overall employment rate reaches 100%. Through visits and surveys of employers, it is evident that enterprises highly appreciate students' comprehensive abilities, including moral qualities, psychological qualities, self-learning abilities at work, teamwork capabilities, and especially their professional and innovative skills. The graduates align well with the talents needed by employers.

#### 4. Conclusion

Deepening the integration of industry and education to promote the reform of vocational talent cultivation models holds significant practical significance for addressing the shortage of high-quality skilled talents in modern fisheries. While our college has achieved certain results in school-enterprise cooperation and industry-education integration, there are still many shortcomings. In future development, it is necessary to continue summarizing experiences and shortcomings, continuously optimize talent cultivation models and curriculum systems, further deepen industry-education integration, focus on industrial development, leverage professional characteristics and advantages, contribute to rural revitalization, and contribute to the stable output of high-quality fisheries science and technology talents.

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